Attachment 4

Supporting Documentation for SIP Emission Reduction Credits for Agricultural BMPs

1. The agricultural growth factors developed by Maricopa Association of Governments (MAG) to project the 1994 annual PM_{10} emissions to 1995, 2001, 2003 and 2006 are described in Appendix 2: Exhibit 8 of the Revised Technical Support Document (TSD).[1] The 2001, 2003 and 2006 total acres were estimated by assuming that the historical average annual change in acreage (from 1978 to 1994) was equal to the annual change for years beyond 1994, a decrease of 8,753 acres per year. The acreage harvested for 1994 and 1995 was obtained from 1995 Arizona Agricultural Statistics and the historical annual change in acreage was obtained from Agricultural Statistics: Historical Summary of County Data 1978 to 1989 and 1994 Arizona Agricultural Statistics. Projection factors were derived by dividing the 1995, 2001, 2003, or 2006 total harvested acreage by the 1994 harvested acreage.

2. Although the combined TSD[2] reductions are greater than the Revised MAG 1999 Plan reductions,[3] (i.e., 37.0 percent versus 36.0 percent for wind erosion reductions, 31.5 percent versus 0.32 percent for tillage and harvest reductions, and 17.3 percent versus 0 [not estimated] for travel on unpaved agricultural roads, for the TSD versus the Revised MAG 1999 Plan, respectively), a couple of important differences exist that make a direct comparison infeasible. First, the TSD emissions (on which the reductions are based) are estimated for a specific design day (April 9, 1995), while the basis for the Revised MAG 1999 Plan is metric tons per average annual day. Second, the emission reductions in the Revised MAG 1999 Plan assume implementation of only one BMP to reduce tillage emissions (i.e., the effect of reduced tillage during high-wind days). However, the TSD reductions are based on the implementation of three BMPs (i.e., reduced

[1]Revised MAG 1999 Serious Area Particulate Plan for PM_{10} for the Maricopa County Nonattainment Area. Appendices Volume Two. February 2000. Revised Technical Support Document for Regional PM_{10} Modeling in Support of the Revised MAG 1999 Serious Area Particulate Plan for PM_{10} for the Maricopa County Nonattainment Area. Appendix 2: Exhibit 8.

[2]Revised Final Draft Technical Support Document for Quantification of Agricultural Best Management Practices. Prepared for Arizona Department of Environmental Quality. Prepared by URS Corporation and Eastern Research Group, Inc. April 23, 2001. Page 4-5.

[3]Revised MAG 1999 Serious Area Particulate Plan for PM_{10} for the Maricopa County Nonattainment Area. Appendices Volume Two. February 2000. Revised Technical Support Document for Regional PM_{10} Modeling in Support of the Revised MAG 1999 Serious Area Particulate Plan for PM_{10} for the Maricopa County Nonattainment Area. Chapter V. Page V-62 - V-63.

tillage during high-wind days, combining tractor operations, and multi-year crops), each having a different control efficiency and applicability based on crop type. Third, the TSD includes emissions and reductions associated with travel on unpaved agricultural roads while the Revised MAG 1999 Plan does not consider this specific source nor any associated reductions. The combined effect of these differences results in a greater level of control in the TSD compared to the Revised MAG 1999 Plan for tillage and harvest (i.e., 31.5 percent and 0.32 percent, respectively), and unpaved road emissions (i.e., 17.3 percent and 0, respectively). Note that the reductions attributable to wind erosion control in both the TSD and Revised MAG 1999 Plan are virtually the same (i.e., 37.0 percent and 36.0 percent, respectively).

3. Emissions from the land uses that will succeed agriculture are captured in increased vehicle traffic miles and increased construction activities for agricultural land converted to residential and commercial property . The traffic estimates are described in Appendix II Exhibit 4 of the Revised TSD.[4] Exhibit 4 contains a detailed description of the traffic data used to estimate on-road mobile emissions. The population and employment estimates used in the on-road mobile estimates are the most recent estimates which have been officially approved by MAG. These estimates are based on county control totals developed by the Arizona Department of Economic Security. However, the land use modeling on which the adopted population and employment projections for 2006 are based is not described in the TSD. MAG provided ADEQ with information which describes a Subarea Allocation Model (SAM) developed to forecast residences, employment and special population groups by 1500+ Traffic Analysis Zones (TAZ) for the Phoenix metropolitan area. The TAZ forecasts for 2000-2020 are currently used by MAG to prepare regional transportation, environmental and human services plans. SAM forecasts land use and development throughout the MAG planning region. It does this by simulating factors that influence the value of land and the likelihood that land will be built, based on those factors. The land use, population and socioeconomic modeling at MAG is based on a three-tier modeling process.

   - The first tier model is a county level model. In accordance with Executive Order 95-2, the preparation of county and state level population projections is the responsibility of the Arizona Department of Economic Security. This model is a demographic model, projecting births, deaths and net migration in each county for a fifty-year time horizon.

   - For the second tier process, MAG uses two models, Disaggregated Residential Allocation Model (DRAM) and Employment Allocation Model (EMPAL) which projects the spatial patterns of households and employment in the MAG region. The forecasting procedure

[4]Revised MAG 1999 Serious Area Particulate Plan for PM_{10} for the Maricopa County Nonattainment Area. Appendices Volume Two. February 2000. Revised Technical Support Document for Regional PM_{10} Modeling in Support of the Revised MAG 1999 Serious Area Particulate Plan for PM_{10} for the Maricopa County Nonattainment Area. Appendix II, Exhibit 4.

starts with regional trends, transportation facility descriptions and data on the current location of employment by sector. This information is then used to project the future location of households. The projections are done for five-year intervals.

- **S** The third tier Subarea Allocation Model (SAM) allocates population and employment from Regional Analysis Zones (RAZ) to one acre grids which are then aggregated to Traffic Analysis Zones (TAZ). SAM generates simulations of how Phoenix will grow as a region over time. Its current role is to bridge the gap between the spatial allocation model, DRAM/EMPAL, and EMME/2, MAG's transportation model that works on much more detailed geographies. So, SAM's official role is an "allocation" model in that it disaggregates the land use forecasts generated by DRAM/EMPAL for large statistical areas to smaller TAZs that are needed to drive the transportation model.

The allocation mechanism in the model simulates the growth of regions by looking for land that is best suited for absorbing development. In order to be considered a candidate to absorb growth, land must be currently undeveloped or planned for redevelopment. An existing land use shape file with codes designating "urban vacant" or "agriculture", describe these conditions.

4. Emissions from construction activities that will succeed agriculture are discussed in Appendix II Exhibit 10 of the Revised TSD.[5] The development of Residential, Commercial, and Total Construction surrogates was accomplished using the following ARCINFO coverages: 1996 TAZ, 1995 Land Use, the MAG General Plan, and a database which included adopted population, housing, and employment projections, based on the 1995 Special Census and the 1995 MAG Employment Survey. New surrogates were created for 1995, 2001, and 2006.

   To create the 1995 surrogates, the increase in households and total employment between 1995 and 2000 by the Traffic Analysis Zone (TAZ) was determined based on the database. To estimate the amount of development that occurred between 1995 and 2000, the increase in households per TAZ was divided by 7 households per acre and the increase in total employment per TAZ was divided by 20 employees per acre. This calculation estimates the new household acres and employment acres per TAZ. Next, the number of acres of vacant land and agricultural acres from the 1995 land use coverage that were also coded as residential or commercial acreage in the MAG General Plan were calculated by TAZ. This calculation represents the maximum new acres of residential and commercial use per TAZ. The estimated acres were compared to the maximum acres and if the estimates exceed the maximum, they were set to the maximum. If there were no

[5]Revised MAG 1999 Serious Area Particulate Plan for PM_{10} for the Maricopa County Nonattainment Area. Appendices Volume Two. February 2000. Appendix A, Exhibit 7: Revised Technical Support Document for Regional PM-10 Modeling in Support of Revised MAG 1999 Serious Area Particulate Plan For PM_{10} For the Maricopa County Nonattainment Area. Appendix II, Exhibit 10

vacant acres or agricultural land in a TAZ, the number of new household and employment acres was set to zero. The new household acres by TAZ were used as the spatial surrogate for 1995 residential construction. The new employment acres by TAZ were used as the spatial surrogate for 1995 commercial construction. Since MAG was only interested in the surrogates by PM_{10} grid cell rather than by TAZ, the new construction surrogates (in acres) in the TAZ domain were converted to the PM_{10} modeling domain. To create the 2001 and 2006 construction surrogates, the procedure described above was used, except that the change in households and employment between 2000 and 2005 and change in households and employment between 2005 and 2010 were used for 2001 and 2006, respectively.